Billing Code

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R4–ES–2019–0081; FF09E22000 FXES11130900000 201

RIN 1018-BD95

Endangered and Threatened Wildlife and Plants; Removal of the Dwarf-flowered Heartleaf from the Federal List of Endangered and Threatened Plants

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), propose to remove the dwarf-flowered heartleaf (*Hexastylis naniflora*), a plant endemic to the upper Piedmont region of western North Carolina and upstate South Carolina, from the Federal List of Endangered and Threatened Plants (List). This determination is based on a thorough review of the best available scientific and commercial data, which indicate that the threats to the species have been eliminated or reduced to the point that the species no longer meets the definition of a threatened species, and does not meet the definition of an endangered species, under the Endangered Species Act of 1973, as amended (Act). We also announce the availability of a draft post-delisting monitoring (PDM) plan for the dwarf-flowered heartleaf. We seek information, data, and comments from the public regarding this proposal to delist this species and on the draft PDM plan.

DATES: We will accept comments received or postmarked on or before [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]. Comments submitted electronically using the Federal eRulemaking Portal (see **ADDRESSES**, below) must be received by 11:59 p.m. Eastern Time on the closing date. We must receive requests for a public hearing, in writing, at the address shown in **FOR FURTHER INFORMATION**

CONTACT by [INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: You may submit comments on this proposed rule by one of the following methods:

(1) *Electronically*: Go to the Federal eRulemaking Portal: *http://www.regulations.gov*. In the Search box, enter FWS–R4–ES–2019–0081, which is the docket number for this rulemaking. Then, click on the Search button. On the resulting page, in the Search panel on the left side of the screen, under the Document Type heading, check the Proposed Rule box to locate this document. You may submit a comment by clicking on "Comment Now!"

(2) *By hard copy*: Submit by U.S. mail to: Public Comments Processing, Attn: FWS–R4–ES–2019–0081, U.S. Fish and Wildlife Service, MS: JAO/1N, 5275 Leesburg Pike, Falls Church, VA 22041–3803.

We request that you send comments only by the methods described above. We will post all comments on *http://www.regulations.gov*. This generally means that we will post any personal information you provide us (see **Information Requested**, below, for more information).

Document availability: The proposed rule, draft PDM plan, and supporting documents (including the species status assessment (SSA) report, references cited, and 5-year review) are available at *http://www.regulations.gov* under Docket No. FWS–R4–ES–2019–0081.

FOR FURTHER INFORMATION CONTACT: Janet Mizzi, Field Supervisor, U.S. Fish and Wildlife Service, Asheville Ecological Services Field Office, 160 Zillicoa St., Asheville, NC 28801; telephone 828-258-3939. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Relay Service at 800-877-8339.

SUPPLEMENTARY INFORMATION:

Information Requested

We intend that any final action resulting from this proposed rule will be based on the best scientific and commercial data available and be as accurate and as effective as possible. Therefore, we request comments and information from other concerned governmental agencies (including, but not limited to, State and Federal agencies and city or county governments), Native American tribes, the scientific community, industry, or any other interested party concerning this proposed rule. We particularly seek comments on:

(1) Information concerning the biology and ecology of dwarf-flowered heartleaf;

(2) Relevant data concerning any threats (or lack thereof) to dwarf-flowered heartleaf, particularly any data on the possible effects of climate change as it relates to habitat, as well as the extent of State protection and management that would be provided to this plant as a delisted species;

(3) Current or planned activities within the geographic range of dwarf-flowered heartleaf that may negatively impact or benefit the species; and

(4) The draft PDM plan and the methods and approach detailed in it.

Please include sufficient information with your submission (such as scientific journal articles or other publications) to allow us to verify any scientific or commercial information you include.

Please note that submissions merely stating support for, or opposition to, the action under consideration without providing supporting information, although noted, will not be considered in making a determination, as section 4(b)(1)(A) of the Act directs that determinations as to whether any species is an endangered or a threatened species must be made "solely on the basis of the best scientific and commercial data available."

You may submit your comments and materials concerning this proposed rule by one of the methods listed in **ADDRESSES**. We request that you send comments only by the methods described in **ADDRESSES**.

If you submit information via *http://www.regulations.gov*, your entire submission—including any personal identifying information—will be posted on the website. If your submission is made via a hardcopy that includes personal identifying information, you may request at the top of your document that we withhold this information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy submissions on *http://www.regulations.gov*.

Comments and materials we receive, as well as supporting documentation used in preparing this proposed rule, will be available for public inspection on *http://www.regulations.gov*.

Public Hearing

Section 4(b)(5)(E) of the Act provides for a public hearing on this proposal, if requested. Requests must be received by the date specified in **DATES**. Such requests must be sent to the address shown in **FOR FURTHER INFORMATION CONTACT**. We will schedule a public hearing on this proposal, if requested, and announce the date, time, and place of the hearing, as well as how to obtain reasonable accommodations, in the *Federal Register* at least 15 days before the hearing. For the immediate future, we will provide these public hearings using webinars that will be announced on the Service's website, in addition to the *Federal Register*. The use of these virtual public hearings is consistent with our regulation at 50 CFR 424.16(c)(3).

Peer Review

In accordance with our joint policy on peer review published in the *Federal Register* on July 1, 1994 (59 FR 34270) and our August 22, 2016, memorandum updating and clarifying the role of peer review of classification actions under the Act, we sought the expert opinions of seven appropriate specialists regarding the species status assessment (SSA) report, which informed this proposed rule. Out of the seven reviews requested, we received no responses. The purpose of peer review is to ensure our determination is based on scientifically sound data, assumptions, and analyses.

Because we will consider all comments and information received during the comment period, our final determinations may differ from this proposal. Based on the new information we receive (and any comments on that new information), we may conclude that the species is still in danger of extinction, either now or in the foreseeable future. Such final decisions would be a logical outgrowth of this proposal, as long as we: (a) base the decisions on the best scientific and commercial data available after considering all of the relevant factors; (2) do not rely on factors Congress has not intended us to consider; and (3) articulate a rational connection between the facts found and the conclusions made, including why we changed our conclusion.

Previous Federal Actions

On April 14, 1989, we listed dwarf-flowered heartleaf as threatened due to residential and industrial development, conversion of habitat to pasture or small ponds, timber harvesting, and cattle grazing (54 FR 14964). A recovery plan for the species was never completed. However, over the last 30 years, the Service has worked closely with partners to recover this species. The Service initiated the dwarf-flowered heartleaf SSA report to aid in determining the appropriateness of reclassifying the species.

Supporting Documents

A species status assessment team prepared an SSA report for the dwarf-flowered heartleaf. The SSA team was composed of Service biologists, in consultation with other species experts. The SSA report represents a compilation of the best scientific and commercial data available concerning the status of the species, including the impacts of past, present, and future factors (both negative and beneficial) affecting the species.

Proposed Delisting Determination

Background

Dwarf-flowered heartleaf is a plant species endemic to the upper Piedmont region of western North Carolina and upstate South Carolina. It is a low-growing herbaceous plant in the birthwort family (Aristolochiaceae). Although dwarf-flowered heartleaf is restricted in range, it

is not as rare as once thought (Service 2010, p. 15; North Carolina Natural Heritage Program (NCNHP) 2016, p. 4). When dwarf-flowered heartleaf was federally listed in 1989, the listing rule described 24 extant populations (and one extirpated population) distributed across eight counties in the upper Piedmont of North and South Carolina. As of 2018, the distribution of this species consisted of 78 populations distributed across 13 counties in these two States. In North Carolina, it is found in Alexander, Burke, Caldwell, Catawba, Cleveland, Gaston, Iredell, Lincoln, Polk, and Rutherford Counties. In South Carolina, it is found in Cherokee, Greenville, and Spartanburg Counties.

Dwarf-flowered heartleaf is historically known to have a restricted range due to its habitat requirements. The habitat where dwarf-flowered heartleaf exists is limited in size and scope due to a multitude of factors including soil type, moisture availability, and slope aspect (Padgett 2004, p. 81). This unique combination of factors limits not only the range of dwarf-flowered heartleaf, but also the size of any population.

Dwarf-flowered heartleaf occurs in Piedmont uplands on acidic sandy-loam soils that are very deep and moderately permeable (Gaddy 1981, p. 7; 1987, pp. 186–196). Typical habitats for this species include mesic to dry bluffs, slopes, or ravines in deciduous forests that are frequently associated with mountain laurel (*Kalmia latifolia*) (Padgett 2004, p. 114; Weakley 2015, p. 129; Service 2015, entire), or in moist soils adjacent to creeks or streamheads, or along lakes and rivers. Plants grow larger and have more frequent flowering in floodplains along rivers, lakes, and streams (Newberry 1993, entire). A habitat suitability study was conducted to quantify the habitat requirements for dwarf-flowered heartleaf, which may be used to help identify the species when not in flower (relative to other *Hexastylis* species' habitat preferences), find new populations, or identify suitable sites for transplants (Wagner 2013, pp. 30-32). The unit of measurement for population size in this species is a "clump" (rosette).

A thorough review of the taxonomy, life history, ecology, and overall viability of the dwarf-flowered heartleaf is presented in the SSA report (Service 2018, entire; available at

https://www.fws.gov/southeast/ and at *http://www.regulations.gov* under Docket No. FWS–R4–ES–2019–0081).

Regulatory and Analytical Framework

Regulatory Framework

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species is an "endangered species" or a "threatened species." The Act defines an endangered species as a species that is "in danger of extinction throughout all or a significant portion of its range," and a threatened species as a species that is "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." The Act requires that we determine whether any species is an "endangered species" or a "threatened species" because of any of the following factors:

(A) The present or threatened destruction, modification, or curtailment of its habitat or range;

(B) Overutilization for commercial, recreational, scientific, or educational purposes;

(C) Disease or predation;

(D) The inadequacy of existing regulatory mechanisms; or

(E) Other natural or manmade factors affecting its continued existence.

We must consider these same five factors in reclassifying or delisting a species. In other words, for species that are already listed as endangered or threatened, the analysis for delisting due to recovery must include an evaluation of the threats that existed at the time of listing, the threats currently facing the species, and the threats that are reasonably likely to affect the species in the foreseeable future. These factors represent broad categories of natural or human-caused actions or conditions that could have an effect on a species' continued existence. In evaluating these actions and conditions, we look for those that may have a negative effect on individuals of the species, as well as other actions or conditions that may ameliorate any negative effects or may have positive effects.

We use the term “threat” to refer, in general, to actions or conditions that are known to or are reasonably likely to negatively affect individuals of a species. The term “threat” includes actions or conditions that have a direct impact on individuals (direct impacts), as well as those that affect individuals through alteration of their habitat or required resources (stressors). The term “threat” may encompass—either together or separately—the source of the action or condition or the action or condition itself.

However, the mere identification of any threat(s) does not necessarily mean that the species meets the statutory definition of an “endangered species” or a “threatened species.” In determining whether a species meets either definition, we must evaluate all identified threats by considering the likely response by the species, and the effects of the threats—in light of those actions and conditions that will ameliorate the threats—on an individual, population, and species level. We evaluate each threat and its effects on the species, then analyze the cumulative effect of all of the threats on the species as a whole. We also consider the cumulative effect of the threats in light of those actions and conditions that will have positive effects on the species, such as any existing regulatory mechanisms or conservation efforts. The Secretary determines whether the species meets the definition of an “endangered species” or a “threatened species” only after conducting this cumulative analysis and describing the expected effect on the species now and in the foreseeable future.

The Act does not define the term “foreseeable future,” which appears in the statutory definition of “threatened species.” Our implementing regulations at 50 CFR 424.11(d) set forth a framework for evaluating the foreseeable future on a case-by-case basis. The term “foreseeable future” extends only so far into the future as the Services can reasonably determine that both the future threats and the species’ responses to those threats are likely. In other words, the foreseeable future is the period of time in which we can make reliable predictions. “Reliable” does not mean “certain”; it means sufficient to provide a reasonable degree of confidence in the

prediction. Thus, a prediction is reliable if it is reasonable to depend on it when making decisions.

It is not always possible or necessary to define foreseeable future as a particular number of years. Analysis of the foreseeable future uses the best scientific and commercial data available and should consider the timeframes applicable to the relevant threats and to the species' likely responses to those threats in view of its life-history characteristics. Data that are typically relevant to assessing the species' biological response include species-specific factors such as lifespan, reproductive rates or productivity, certain behaviors, and other demographic factors.

Analytical Framework

The SSA report documents the results of our comprehensive biological status review for dwarf-flowered heartleaf, including an assessment of the potential threats to the species. The SSA report does not represent a decision by the Service on whether the species should be proposed for removal from the List of Endangered and Threatened Plants (i.e., "delisting"). It does, however, provide the scientific basis that informs our regulatory decision, which involves the further application of standards within the Act and its implementing regulations and policies. The following is a summary of the key results and conclusions from the SSA report; the full SSA report can be found on the Southeast Region website at *https://www.fws.gov/southeast/* and at *http://www.regulations.gov* under Docket No. FWS–R4–ES–2019–0081.

Summary of SSA Analysis

To assess dwarf-flowered heartleaf viability, we used the three conservation biology principles of resiliency, redundancy, and representation (Shaffer and Stein 2000, pp. 306–310). Briefly, resiliency supports the ability of the species to withstand environmental and demographic stochasticity (for example, wet or dry, warm or cold years), redundancy supports the ability of the species to withstand catastrophic events (for example, droughts, large pollution events), and representation supports the ability of the species to adapt over time to long-term changes in the environment (for example, climate changes causing earlier spring flowering). In

general, the more resilient and redundant a species is and the more representation it has, the more likely it is to sustain populations over time, even under changing environmental conditions. Using these principles, we identified the species' ecological requirements for survival and reproduction at the individual, population, and species levels, and described the beneficial and risk factors influencing the species' viability.

The SSA process can be categorized into three sequential stages. During the first stage, we evaluated the individual species' life-history needs. In the next stage, we assessed the historical and current condition of the species' demographics and habitat characteristics, including an explanation of how the species arrived at its current condition. In the final stage, we made predictions about the species' responses to positive and negative environmental and anthropogenic influences. This process used the best available information to characterize the species' viability (i.e., its ability to sustain populations in the wild over time). We used this information to inform this proposed rule.

Summary of Biological Status and Threats

In this discussion, we review the biological condition of the species and its resources, and the threats that influence the species' current and future condition, in order to assess the species' overall viability and the risks to that viability.

Current Condition

Resiliency

For dwarf-flowered heartleaf to maintain viability, its populations, or some portion thereof, must be resilient. Resiliency is assessed at the level of populations and reflects a species' ability to withstand stochastic events (events arising from random factors). Resilient populations are better able to withstand disturbances such as random fluctuations in reproductive rates and fecundity (demographic stochasticity), variations in rainfall (environmental stochasticity), and the effects of anthropogenic activities. Stochastic factors that have the potential to affect dwarf-flowered heartleaf include habitat impacts, climate change, and exotic, invasive species. Factors

influencing the resiliency of dwarf-flowered heartleaf populations include population size, available habitat, and elements of dwarf-flowered heartleaf ecology that determine whether populations can maximize habitat occupancy.

The Natural Heritage Programs (NHP) collect information on occurrences of rare plants, animals, natural communities, and animal assemblages. Collectively, these are referred to as "elements of natural diversity" or simply as "elements." Locations of these elements are referred to as "element occurrences" (EO records). In recent years, NatureServe and its member NHPs have devised mapping standards to balance the need for fine-scale, highly site-specific EO records (required for monitoring and management) with the need to aggregate these records in meaningful units of conservation interest that may approximate biological populations (NatureServe 2004, n.p.). We regard the NHP database as the best repository for known locations of the dwarf-flowered heartleaf (Service 2010, p. 41). Populations are composed of both multiple sub-EOs and stand-alone EO records. For the purpose of assessing resiliency, 78 populations observed since 2005 were assessed due to the high confidence in their persistence. These new populations are results of additional survey efforts.

To determine overall resiliency for populations, we used EO viability ranks and expert opinion to bin population size classes into corresponding resiliency categories. EO viability ranks for the species include excellent, good, fair, poor, extant, historical, and failed to find. The primary factor in determining these ranks is EO size (as quantified by number of clumps). Condition of habitat (vegetation community and structure) and landscape context (extent of suitable habitat and physical factors) are incorporated secondarily. Recent reports (Robinson 2016, p. 7; Robinson and Padgett 2016, p. 4) focus monitoring studies on populations with greater than 1,000 individuals (assumed to be very viable). Because we do not have habitat-level information for every population we assessed, we synthesized available population size information and created four resiliency categories as follows:

- Very high—populations with more than 1,000 individuals; very high probability of persistence for 20–30 years at or above the current population size.
- High—populations with 500 to 1,000 individuals; moderately high probability of persistence for 20–30 years at or above the current population size.
- Moderate—populations with 100 to 500 individuals; low probability of persistence for 20–30 years at or above the current population size.
- Low—populations with fewer than 100 individuals; low probability of persistence for 20–30 years at or above the current population size, and moderately high probability of extirpation.

Of the 78 populations assessed, 28 have very high resiliency, 5 have high resiliency, 26 have moderate resiliency, and 19 have low resiliency.

Redundancy

Redundancy is also assessed at the species level and reflects a species' ability to withstand catastrophic events (such as a rare destructive natural event or episode involving many populations) by spreading the risk of such an event across multiple, resilient populations. We measured redundancy for dwarf-flowered heartleaf by the number and distribution of resilient populations across the range of the species. It is important to note that dwarf-flowered heartleaf has a naturally limited range, so measures of redundancy reflect the distribution within a relatively small area. Redundancy for dwarf-flowered heartleaf is the total number and resiliency of population segments and their distribution across the species' range.

We consider a catastrophe to be any population-level disturbance with the potential to negatively influence population resiliency outside of normal environmental and demographic stochasticity. Disturbances often act quickly, and often with devastating effects; however, they can occur over long periods of time. A disturbance that occurs as a relatively discrete event in time, such as a hurricane, is referred to as a "pulse" disturbance, while more gradual or cumulative pressures on a system are referred to as "press" disturbances. Both types of

disturbances are part of the natural variability of dwarf-flowered heartleaf ecological systems, and must be considered when assessing redundancy. While there is certainly a variety of potential pulse disturbances for the species (timber harvest, hydrological alterations, road and right-of-way construction), the primary potential catastrophic disturbances are press disturbances from long-term climate change, which have great potential to affect ecosystem processes and communities by altering the underlying abiotic conditions such as temperature and precipitation changes (DeWan et al. 2010, pp. 7–10).

Representation

Because we lack genetic and ecological diversity data to characterize representation for dwarf-flowered heartleaf, we decided delineating representative units was not appropriate for this species. However, in the absence of species-specific genetic and ecological diversity information, we evaluated representation based on the extent and variability of habitat characteristics across the geographical range. Dwarf-flowered heartleaf occurs in two types of habitat throughout the range. Typical habitats for this species include mesic to dry bluffs, slopes, or ravines in deciduous forests that are frequently associated with mountain laurel (Padgett 2004, entire; Weakley 2015, entire; USFWS 2015, entire), or moist soils adjacent to creeks, streamheads, or along lakes and rivers. This variation in habitat type provides species representation in drier and wetter habitats, demonstrating the species' ability to adapt to changing environmental conditions.

We note that, by using the SSA framework to guide our analysis of the scientific information documented in the SSA report, we have not only analyzed individual effects on the species, but we have also analyzed their potential cumulative effects. We incorporate the cumulative effects into our SSA analysis when we characterize the current and future condition of the species. Our assessment of the current and future conditions encompasses and incorporates the threats individually and cumulatively. Our current and future condition assessment is iterative because it accumulates and evaluates the effects of all the factors that may be

influencing the species, including threats and conservation efforts. Because the SSA framework considers not just the presence of the factors, but to what degree they collectively influence risk to the entire species, our assessment integrates the cumulative effects of the factors and replaces a standalone cumulative effects analysis.

Summary of Threats and Conservation Measures that Affect the Species

The NCNHP assessed threats in the populations they monitored from 2012 through 2016 (Robinson and Padgett 2016, pp. 7–8, 17–20). Threats that were observed, inferred, or suspected to have an impact on populations were recorded and assigned a ranking based on field observations of severity, scope, and immediacy. The rank (A through G) for each threat factor determined an overall value for each threat observed at each population. Threats observed during these years included development; incompatible forestry practices; agriculture; trampling; invasive, exotic species; sedimentation; erosion; and road construction. In this rule, we discuss the major threats affecting the species, which include development, climate change and invasive, exotic species.

Development

Dwarf-flowered heartleaf populations occur in rapidly growing urban areas within numerous counties in North and South Carolina. At the time of listing, the species was determined to be most threatened by habitat loss due to the conversion of land to residential, commercial, and industrial use in these areas. Populations occurring in more rural areas are also threatened by habitat alteration or loss from land conversion to pasture or other agricultural uses, cattle grazing, intensive timber harvesting, residential construction, and construction of small ponds (Robinson 2016, p. 10; Robinson and Padgett 2016, p. 5).

The most recent 5-year review for the species identified the most recurrent source of habitat destruction as road and bridge improvement projects which is the most common trigger for consultations under section 7 of the Act involving dwarf-flowered heartleaf. Ten of the 27 largest populations (containing more than 1,000 rosettes) have been the subject of section 7

consultations. Collectively, these projects have adversely impacted or were expected to impact approximately 22,135 rosettes (Service 2018, p. 31). In most cases, the section 7 process resulted in avoidance or minimization of adverse effects through relocation of plants and/or commitments of on-site protection. Significant portions of other populations have been purchased by the North Carolina Department of Transportation (NCDOT) as off-site conservation measures in association with these consultations. The purpose of this purchase is to protect the dwarf-flowered heartleaf. Other forms of economic development have also resulted in the destruction or modification of habitats occupied by dwarf-flowered heartleaf; in many cases, these activities have also required section 7 consultations with the Service. Examples include the maintenance or expansion of hydroelectric and drinking water reservoirs, construction of an industrial development complex, and maintenance activities at a regional airport. Collectively, these activities involved the loss or relocation of several thousand rosettes.

Development was identified as a threat at five of 10 North Carolina populations monitored by NCNHP (Robinson and Padgett 2016, pp. 17–19). The five populations include two stand-alone EOs and three parent EOs with 18 sub-EOs. Of the two stand-alone EOs, one has a development threat rank of A (moderate to severe, imminent threat for most (more than 60 percent) of population, occurrences, or area) and one has a rank of B (moderate to severe, imminent threat for a significant portion (20–60 percent) of the population, occurrences, or area). Of the 18 sub-EOs, nine have development identified as a threat. Of the nine sub-EOs, one has a development threat rank of A, one has a rank of B, one has a rank of E (moderate to severe threat for a small proportion of population, occurrences, or area), and six have a rank of F (low severity threat for most or a significant proportion of population, occurrences, or area). The two stand-alone EOs and two sub-EOs with the highest threat ranks (A and B) are located in four populations. Based on the most recent monitoring data, one is increasing, two are stable, and one is decreasing (Robinson and Padgett 2016, p. 11). Even where development is ranked as a high threat, impacts to dwarf-flowered heartleaf are not a certain outcome.

Development was identified as a threat at one of three South Carolina populations monitored by NCNHP, and the population has a development threat rank of E (Robinson and Padgett 2016, p. 20). Based on the most recent monitoring data, the population is stable (Robinson and Padgett 2016, p. 11).

The data indicate that dwarf-flowered heartleaf populations can persist and increase in the presence of development. From 2012 to 2016, there were insignificant changes in the severity of the threat observed in the field from development (NCNHP 2016, p. 8).

The North Carolina Plant Protection and Conservation Act (North Carolina General Statutes, sections 106-202.12 et seq.) lists native plants as threatened, endangered, or species of concern, and provides limited protection from collection and trade of listed plants. However, this statute does not protect the species or its habitat from destruction in conjunction with development projects or otherwise legal activities. In North Carolina, the NCNHP designates "natural areas", which are sites with biological diversity significance due to the presence of rare species or unique natural communities. The NCNHP works with many conservation partners (state and federal agencies, conservation organization, land trusts, etc.) to implement voluntary protection. Through partnerships, the most important natural areas are purchased for permanent conservation. If a natural area is not available for purchase, ecological significance can be recognized by a voluntary registry agreement. Registry agreements consist of Registered Heritage Areas (RHAs), which are voluntary conservation agreements between the landowner and NCNHP to preserve the natural area and biological diversity of the property. The NCNHP has four registry agreements that include dwarf-flowered heartleaf. In South Carolina, plants are protected only from disturbance where they occur on those properties owned by the State and specifically managed as South Carolina Heritage Preserves (South Carolina Code of State Regulations, chapter 123, sections 123-200 through 123-204). Heritage Preserves are protected areas that play a critical role in conserving rare species and natural habitats. There is one

Heritage Preserve in South Carolina, which protects one population of the dwarf-flowered heartleaf.

The overwhelming majority of dwarf-flowered heartleaf populations have been discovered as a direct result of surveys conducted to ensure compliance with the Act. The majority of sites that have the potential to afford long-term protection to the species have been protected as a result of consultations under section 7 of the Act, which directs federal agencies to avoid and minimize adverse effects to federally listed species. Through section 7 and other voluntary conservation actions, approximately 24 (31%) of the 78 current populations are permanently protected, and another 18 populations (23%) are partially protected, greatly minimizing the likelihood of impacts due to development. Together, these two groups of populations make up over 50% of the areas under some form of protective mechanism in the absence of the ESA protections.

Invasive, Exotic Species

Invasive, exotic plant species occur across the range of this species. Plants such as English ivy (*Hedera helix*), Chinese privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), and Japanese stiltgrass (*Microstegium vimineum*) are known at several sites that contain dwarf-flowered heartleaf (Service 2011, p. 15). Invasive, exotic species were identified as a threat at eight of 10 North Carolina populations monitored by NCNHP (Robinson and Padgett 2016, pp. 17–19). The eight populations include four stand-alone EOs and four parent EOs with 19 sub-EOs. Of the four stand-alone EOs, one has an invasive threat rank of B (moderate to severe, imminent threat for a significant portion (20–60 percent) of the population, occurrences, or area), two have a rank of F (low severity threat for most or a significant proportion of population, occurrences, or area), and one has a rank of G (low severity threat for a small proportion of population, occurrences, or area). Of the 19 sub-EOs, 9 have invasive, exotic species identified as a threat. Of the nine sub-EOs, one has an invasive threat rank of A (moderate to severe, imminent threat for most (more than 60 percent) of population, occurrences,

or area), four have a rank of B, two have a rank of E (moderate to severe threat for a small proportion of population, occurrences, or area), and two have a rank of G. The one stand-alone EO and five sub-EOs with the highest threat ranks (A and B) are located in three populations. Based on the most recent monitoring data, one is increasing, one is stable, and one is decreasing (Robinson and Padgett 2016, p. 11). Even where nonnative species are ranked as a high threat, impact to dwarf-flowered heartleaf is not a certain outcome.

Invasive, exotic species were identified as a threat at all (three) South Carolina populations monitored by NCNHP, and all sites had an invasive threat rank of F (Robinson and Padgett 2016, p. 20). Based on the most recent monitoring data, all populations are stable (Robinson and Padgett 2016, p. 11).

In short, the data indicate that dwarf-flowered heartleaf populations can persist and increase in the presence of invasive, exotic species. Despite the long-term presence of invasive, exotic plants, from 2012 to 2016, there were no changes in the severity of threats observed in the field enough to elevate the threat ranks of dwarf-flowered heartleaf populations evaluated (NCNHP 2016, p. 8).

Climate Change

Accelerated climate change (changes in climate on a scale that exceeds historical rates of change) is expected to increase the frequency and extent of drought conditions across the Southeast (Karl et al. 2009, entire). Increased frequency of severe storms could lead to impacts if flooding duration or intensity increase as a result. Increased flooding could decrease habitat suitability through scouring and changes in soil moisture or wash plants away. Warming in the Southeast is expected to be greatest in the summer (NCCV 2016, n.p.), which is predicted to increase drought frequency, while annual mean precipitation is expected to increase slightly, leading to increased flooding events (IPCC 2013, p. 7; NCCV 2016, n.p.). Changes in climate may affect ecosystem processes and communities by altering the abiotic conditions experienced by biotic assemblages, resulting in potential effects on community composition and individual

species interactions (DeWan et al. 2010, p. 7). Although climate change was not a factor leading to the original listing of the species, it should be recognized that the greatest threat from climate change may come from synergistic effects. In recent years, the Southeast has experienced moderate to severe droughts, which many observers have implicated in population declines and poor transplant survivorship (NCNHP 2010). A wildfire, , burned portions of one of the largest known populations in 2009 (Foothills Landfill in Caldwell County, NC; Golder and Associates, 2009). However, observation suggests that the species was not appreciably harmed by this fire (Service 2011, p. 14). Additionally, the National Park Service (NPS) uses prescribed fire as a vegetation management tool at Cowpens National Battlefield. The NPS's prescribed burning activity includes the majority of the dwarf-flowered heartleaf population on site and burning appears to have had no adverse effects upon growth or flowering (Walker et al. 2009, p. 14).

Future Condition

Our analysis of the past, current, and future influences on dwarf-flowered heartleaf revealed that there are several influences that may pose risks to the future viability of the species. These risks are primarily related to invasive species, changes in climate, and habitat changes from development. We consider "foreseeable future" as that period of time within which a reliable prediction can be made about the future status of a species. We consider 20 years to be a reasonable period of time within which reliable predictions can be made for dwarf-flowered heartleaf. This period of time aligns with the timeframes for predictions regarding development and growth (see *Development* below) and climate change (see *Climate Change* below). We discuss in greater detail how we define "foreseeable future" for this species below, under ***Determination***.

Invasive, Exotic Species

As discussed above, invasive, exotic plants were identified as a threat at the time of listing; however, the threat may not be as significant as once thought. The NCNHP monitored 13 populations of dwarf-flowered heartleaf and assessed threats at each population. Of

monitored sites, only 9 percent of populations (one of 11) where invasive, exotic species are present are also in decline, indicating the species has at least some capacity to withstand the presence of invasive, exotic species. The number of populations has increased dramatically since listing as a result of increased survey effort and the invasive, exotic plant threat posed at many of the largest populations is low (NCNHP 2016, pp. 8, 17–20). Additionally, and as noted above, the number of populations managed under conservation ownership has increased. Therefore, we do not believe that competition from invasive, exotic species will be a significant threat in the foreseeable future.

Climate Change

Our analyses under the Act include consideration of ongoing and projected changes in climate. The terms "climate" and "climate change" are defined by the Intergovernmental Panel on Climate Change (IPCC). The term "climate change" thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2014, entire). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative, and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2014, entire). In our analyses, we use the judgment of the experts to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

According to IPCC, "most plant species cannot naturally shift their geographical ranges sufficiently fast to keep up with current and high projected rates of climate change on most landscapes" (IPCC 2014, p. 13). The concept of changing climate can be meaningfully assessed both by looking into the future and reviewing past changes.

As part of the current, worldwide collaboration in climate modelling under the IPCC, climate assessments of the full dataset of 30 climate models for historical and 21st century

comparisons provide predictions at scales ranging from global to county level in the United States (U.S. Geological Survey (USGS) National Climate Change Viewer (NCCV) 2019). This global climate information has been recently downscaled by the National Aeronautics and Space Administration to scales relevant to our region of interest, and projected into the future under two different scenarios of possible emissions of greenhouse gases (Alder and Hostetler 2017, p. 3). Using the NCCV and assuming the "representative concentration pathways" (RCP) greenhouse gas emission scenario RCP 8.5, we calculated projected annual mean changes from 1981–2010 to those projected for 2025–2049 for maximum temperature (+2.9–3.1 degrees Fahrenheit (°F) in NC and +2.9 °F in SC), precipitation (+0.2 inches per month for NC and SC), soil storage (-0.1 - -0.2 inch for NC and -0.1 inch SC), and evaporative deficit (no change for NC or SC) in all counties where dwarf-flowered heartleaf occurs (Adler and Hostetler 2017, entire). We also calculated projected annual mean changes for the RCP 4.5 scenario using the same timeframes for maximum temperature (+2.5–2.7 °F in NC and SC), precipitation (+0.01 inch per month for NC and SC), soil storage (-0.1 - -.02 inch for NC and -0.1 inch for SC), and evaporative deficit (no change for NC or SC) in all counties where dwarf-flowered heartleaf occurs (Adler and Hostetler 2017, entire). Based on these results, all 13 counties within the range of dwarf-flowered heartleaf will be subjected to higher temperatures (annual mean increase of 2.6 °F (RCP 4.5) or 2.9 °F (RCP 8.5)) and slightly higher precipitation (annual mean increase of 0.1 inch per month (RCP 4.5) or 0.2 inch per month (RCP 8.5)) relative to the period of 1981–2010. Because the average annual increase in precipitation is predicted to be only slight, the loss in soil storage is likely primarily the result of higher predicted temperatures.

Dwarf-flowered heartleaf is a long-lived perennial species. Several populations have been revisited after decades and the species was still stable. For example, one population in Rutherford County was first observed in 1957, and was still extant when next observed in 2001 (NCNHP 2018, n.p.). In their analyses of life-history traits in relation to potential vulnerability to variability in demographic vital rates caused by increased variability in climatic patterns,

researchers concluded that longer-lived species should be less influenced by climate-driven increases in demographic variability (Morris *et al.* 2008, p. 22; Dalgleish *et al.* 2010, p. 216).

Within the family Aristolochiaeae, more than 50 percent of the plant lineage is myrmecochorous (seed dispersal by ants) (Lengyel et al. 2010, p. 49). Likewise, dwarf-flowered heartleaf employs myrmecochory as a method for seed dispersal (Gaddy1986, entire). While species with ant-dispersed seeds have slower migration rates than species with seeds that are adhesive or ingested (Brunet and Von Oheimb 1998, p. 429), myrmecochory provides for multiple adaptive advantages for plants. Ants can disperse seeds to sites that might be nutrient-enhanced or where plant fitness will be higher. Additionally, ants bury seeds, which may protect them from fire and drought (Boyd 2001, p. 235), two conditions exacerbated by climate change (Karl et al. 2009, entire). Accelerated climate change is expected to increase the frequency and extent of drought conditions across the Southeast (Karl et al. 2009, p. 111).

Populations are located within various ecological settings within the species' range. Dwarf-flowered heartleaf occurs on Piedmont uplands on acidic sandy-loam soils that are very deep and moderately permeable (Gaddy 1981, p. 7; 1987, pp. 186–196). Typical habitats for this species include mesic to dry bluffs, slopes, or ravines in deciduous forests that are frequently associated with mountain laurel (Padgett 2004, p. 114; Weakley 2015, p. 129), or moist soils adjacent to creeks or streamheads, or along lakes and rivers. This variation in habitat type provides species representation in drier and wetter habitats, demonstrating the species' ability to adapt to different environmental conditions that could be brought on by changing climate.

Development

As discussed above, development was identified as a threat at the time of listing; however, the threat is not be as significant as once thought. The NCNHP monitored 13 populations of dwarf-flowered heartleaf and assessed threats at each population. Of monitored sites, only 12 percent of populations (one of eight) where development is identified as a threat

are also in decline, indicating the species has at least some capacity to withstand the threat of development. The number of populations has increased dramatically since listing and the development threat posed at many of the largest populations is low (NCNHP 2016, pp. 8, 17–20).

In addition, we use three scenarios, projected out to the year 2040. We selected this timeframe because it gives us the ability to reliably predict into the future and to capture the uncertainty related to the potential impacts to each population's resiliency: Status quo, targeted conservation, and high development. Based on the life span of the species, expert input, development as the key risk factor to the species, and uncertainty about future conditions, we chose to project populations out to the year 2040 under each scenario as described in the SSA (p. 34). Results of future projections within each scenario are focused on current populations and potential habitat identified by the Maxent model as described below.

In constructing our scenarios, we considered two main influences by which species viability projections could be affected: location of additional populations (positive influence) and habitat loss and fragmentation due to urban development (negative influence). Habitat quantity can be negatively impacted by development or land use change (particularly on private lands) or positively impacted by land acquisition, restoration, and/or introductions into unoccupied sites that already have suitable habitat.

We use the Slope, Land cover, Exclusion, Urbanization, Transportation, and Hillshade (SLEUTH) model to determine areas predicted to be urbanized by 2040, a time period for which the models provide reliable data. The SLEUTH model has been successfully applied worldwide over the last 15 years to simulate land use change, including urbanization (Clarke 1995, entire). The SLEUTH model predictions are broken down by probabilities of urbanization, ranging from 0 to 100 percent. We chose 80 percent probability as our cutoff, as this cutoff has been used by USGS and by us in other SSAs, and this threshold represents a highly likely outlook for

urbanization of the landscape. To forecast viability using urban development projections, we assessed the following:

- Percent increase in projected development within current populations; and
- Percent increase in projected development within areas delineated as potential habitat by the Maxent habitat model.

We know that certain dwarf-flowered heartleaf populations have been extirpated as the result of urban development in the past through loss of habitat. However, there are no data available on the relationships between urbanization and indirect impacts to dwarf-flowered heartleaf. Because of this unknown, we attempted to capture potential impacts in two ways. First, our scenarios reflect a range of potential impacts from nearby urban development. Also, we used two thresholds for percent increase in urban development to capture potential deleterious effects: 25 percent and 50 percent. Our assumptions were that very small increases in development are unlikely to negatively impact populations; development increase of at least 25 percent of the area of current populations was likely to have some negative impacts; and development increase of at least 50 percent was likely to have significant impacts to populations.

We also assessed potential positive effects by integrating the potential location or rediscovery of additional populations throughout the range into two of our scenarios (targeted conservation and status quo). This is appropriate for several reasons. First, discovery of new EOs is common; many of the populations we consider under **Current Conditions**, above, include detections that have occurred within the last few years. Second, we did not include many older detections (i.e., we only included detections since 2005), although many of those detections are likely to persist. Several EOs have been revisited after more than 10 years, and the species was still present. For example, one such EO was first observed in 1957, next observed in 2001, and last observed in 2017. It seems as long as suitable habitat is still present, it is reasonable to assume that the species is still there. Finally, there is plenty of predicted suitable habitat present

within older EOs based on the Maxent model predictions that were not included as current populations due to the relatively long time since last observation.

The first step in identifying additional areas where dwarf-flowered heartleaf is likely to be found in the future was to identify EOs from populations that were last observed prior to 2005 (i.e., we define current populations as those observed between 2005 and present day). Although our focus is on older EOs, where dwarf-flowered heartleaf is likely to persist into the future, we also included current EOs (2005–current day) in our analysis because we were interested in how the older EOs compared to those known to be persisting on the landscape since 2005. Also, by including older EOs that are within current delineated populations, we can investigate whether current populations might be predicted to contain more plants than the most recent abundance estimate.

Once these older EOs were identified, we created a 1,000-meter buffer around the population and calculated a number of useful metrics, including resiliency category based on the last known abundance estimate, Maxent habitat model metrics, and the results of the SLEUTH model to further refine a list of potential sites where the species would likely be found to persist within our 20–25 year projection window. Resiliency categories were assessed using last known abundance in the same way as populations assessed under **Current Conditions**, above (i.e., low = fewer than 100 individuals; moderate = 100–500 individuals; high = 500–1,000 individuals; very high = greater than 1,000 individuals). We assessed two habitat metrics for these older EOs: average Maxent score and percent Maxent classified as 0.8–1.0 score. Average Maxent score indicates habitat suitability, where in general, the higher the score, the better the habitat, and was calculated by taking the mean Maxent score of all potential habitat within the 1,000-meter buffer. The percent Maxent classified as 0.8–1.0 represents the percentage of all potential habitat within the 1,000-meter buffer that falls within the highest suitability habitat class. Together, these two habitat metrics give general estimates of habitat quantity and quality. Finally, we calculated the total percentage of the 1,000-meter buffer around each EO that is

projected to be urbanized in the year 2040, which helps capture the primary risk factor of development when assessing the areas where dwarf-flowered heartleaf is likely to persist.

Status Quo Scenario

Under the status quo scenario, we estimate that 75 populations will persist throughout the range, and that there will be a range of impacts from urbanization that are related to the percentage increase in urban development and whether a population is protected or not. We assessed population resiliency under the following assumptions:

- Two additional populations are identified as persisting based on Maxent model metrics, last known abundance category, and total predicted urbanization from SLEUTH modelling. Six additional EOs within currently delineated populations not included under **Current Conditions**, above, are predicted to persist based on the same metrics.
- Potential impacts of urban development based on SLEUTH model projections focused on current delineated populations:
    - Protected areas:
        - Protected in perpetuity—no negative impacts from urbanization; and
        - Voluntary protection/non-perpetuity—population drops one resilience rank if percent increase in urbanization exceeds 50 percent threshold.
    - Unprotected areas—population drops one resiliency rank if percent increase in urbanization exceeds 25 percent threshold; population drops two resiliency ranks if percent increase in urbanization exceeds 50 percent threshold.

High Development Scenario

Under the high development scenario, we estimate no additional populations will persist throughout the range, and that impacts from urbanization are relatively high, and are also affected by whether a population is protected or not. We assessed population resiliency under the following assumptions:

- No additional populations are identified as persisting.

- Potential impacts of urban development based on SLEUTH model projections focused on current delineated populations:
    - Protected areas:
        - Protected in perpetuity—population drops one resilience rank if percent increase in urbanization exceeds 50 percent threshold; and
        - Voluntary protection/non-perpetuity—population drops one resiliency rank if percent increase in urbanization exceeds 25 percent threshold; population drops two resiliency ranks if percent increase in urbanization exceeds 50 percent threshold.
    - Unprotected areas—population drops one resiliency rank if percent increase in urbanization exceeds 25 percent threshold; population drops two resiliency ranks if percent increase in urbanization exceeds 50 percent threshold; extirpation of populations if percent increase in urbanization exceeds 90 percent threshold.

Targeted Conservation Scenario

Under the targeted conservation scenario, we estimate it is likely that several additional populations (i.e., more than in the status quo scenario) will persist throughout the range. This scenario accounts for resilience (which is linked to abundance), habitat suitability (as predicted by the model), projected urban development (from SLEUTH), and protection status. Conservation is happening through various partners – State, land trusts or other non-profits, private individuals, etc. The range of impacts from urbanization are the same as in the status quo scenario. We assessed population resiliency under the following assumptions:

- Six populations are identified as persisting based on Maxent model metrics, last known abundance category, and total predicted urbanization from SLEUTH modelling. Six additional EOs within currently delineated populations not included under **Current Conditions**, above, are predicted to persist based on the same metrics.
- Potential impacts of urban development based on SLEUTH model projections focused on current delineated populations:

- Protected areas:
  - Protected in perpetuity—no impacts from urbanization; and
  - Voluntary protection/non-perpetuity—population drops one resiliency rank if percent increase in urbanization exceeds 50 percent threshold.
- Unprotected areas—population drops one resiliency rank if percent increase in urbanization exceeds 25 percent threshold; population drops two resiliency ranks if percent increase in urbanization exceeds 50 percent threshold.

Future Resiliency

Status Quo Scenario

In the status quo scenario, we predict 75 of the 78 populations of dwarf-flowered heartleaf will be extant in 2040. The predicted resiliency of the extant populations are as follows: very high (27); high (6); moderate (23); low (17); and 2 additional populations identified as persisting, with an unknown resiliency. Six EOs within currently delineated populations not included under **Current Conditions**, above, are predicted to persist, but resiliency is unchanged because each of the populations are already predicted to be of very high resiliency. When comparing future population resiliency to current condition, a few populations drop in their resiliency category. One current population of very high resiliency is predicted to drop to high resiliency; two moderate resiliency populations are predicted to drop to low resiliency; and five populations (one currently moderate and four currently low) are predicted to be extirpated due to urban development.

High Development Scenario

In the high development scenario, we predict 72 of the 78 populations of dwarf-flowered heartleaf will remain extant in 2040. The predicted resiliency of the extant populations are as follows: very high (27); high (4); moderate (25); and low (16). No additional populations are identified as persisting. When comparing future population resiliency to current condition, a few populations drop in their resiliency category. One current population of very high resiliency is

predicted to drop to moderate resiliency; one high resiliency population is predicted to drop to moderate resiliency; two moderate resiliency populations are predicted to drop to low resiliency; and six populations (one currently moderate and five currently low) are predicted to be extirpated due to urban development.

Targeted Conservation Scenario

In the targeted conservation scenario, we predicted 79 populations of dwarf-flowered heartleaf will be extant in 2040. The predicted resiliency of the extant populations are as follows: very high (27); high (6); moderate (23); low (17); and 6 additional populations identified as persisting, with an unknown resiliency. Six EOs within currently delineated populations not included under **Current Conditions**, above, are predicted to persist, but resiliency is unchanged because each of the populations are already predicted to be of very high resiliency. When comparing future population resiliency to current condition a few populations drop in their resiliency category. One current population of very high resiliency is predicted to drop to high resiliency; two moderate resiliency populations are predicted to drop to low resiliency; and five populations (one currently moderate and four currently low) are predicted to be extirpated due to urban development.

Viability Summary

Urban development is predicted to have negative impacts on several of the current populations under all of our scenarios. However, this loss of resiliency and extirpation of a few populations is offset in the status quo and targeted conservation scenarios by the persistence of several additional populations. In the high development scenario, there is a predicted loss of six populations, with loss of resiliency in several additional populations. However, in all three scenarios, the majority of the populations are expected to persist in 2040 at a level of at least moderate resiliency.

Given the relatively high number of populations across each scenario, redundancy remains similar to current conditions. That is to say, there appears to be adequate redundancy

within the range of dwarf-flowered heartleaf to withstand the impacts of localized press catastrophic disturbances; however, the species' range is relatively small, making it potentially vulnerable to long-term catastrophic events, such as oil spills over the next 20 to 30 years.

Based on the assumption that dwarf-flowered heartleaf has a very limited range, and after consulting with experts, we decided that delineating representative units was not appropriate. It is worth noting that in two of our scenarios (status quo and targeted conservation), additional populations are found to persist in South Carolina, an area where there are relatively few current populations. There are opportunities to find additional populations based on the amount of predicted unoccupied potential habitat. Although we did not delineate representative units, our scenarios do not predict declines in species representation.

Table of viability summary for dwarf-flowered heartleaf under three future scenarios (projected to year 2040) and compared to current condition.

	Current Condition	Status Quo Scenario	High Development Scenario	Targeted Conservation Scenario
Very High Resiliency	28	27	27	27
High Resiliency	5	6	4	6
Moderate Resiliency	26	23	25	23
Low Resiliency	19	17	16	17
Extirpated	n/a	5	6	5
Persisting	n/a	2	0	6
Total Populations	**78**	**75**	**72**	**79**

Determination of Dwarf-flowered Heartleaf Status

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species meets the definition of

"endangered species" or "threatened species." The Act defines an "endangered species" as a species that is "in danger of extinction throughout all or a significant portion of its range," and a "threatened species" as a species that is "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." For a more detailed discussion on the factors considered when determining whether a species meets the definition of "endangered species" or "threatened species" and our analysis on how we determine the foreseeable future in making these decisions, see *Regulatory Framework*, above.

Status Throughout All of Its Range

After evaluating threats to the species and assessing the cumulative effect of the threats under the section 4(a)(1) factors, we have assessed the best scientific and commercial information available regarding the past, present, and future threats faced by the dwarf-flowered heartleaf. We carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to dwarf-flowered heartleaf. Of the 78 populations, 75 percent are characterized as being either very high, high, or moderately resilient, and many are stable or increasing in trend.

When dwarf-flowered heartleaf was listed (54 FR 14964; April 14, 1989), the two prominent threats identified were invasive, exotic plants and habitat loss or destruction. As discussed above, invasive, exotic species are not as significant a threat to dwarf-flowered heartleaf as originally thought. Only one of the 11 monitored populations where invasive, exotic species occur was identified as declining. Additionally, dwarf-flowered heartleaf has the capacity to withstand habitat loss and destruction due to development. The species currently has significant redundancy (78 populations), resilient populations (33 of 78 evaluated populations with high or very high viability), and representation in two different ecological settings. Even under our high development scenario, only two high or very high viability populations are predicted to have lower viability as a result of development. Therefore, we do not believe that competition from invasive, exotic species or habitat loss and destruction are significant threats to

the species. Additionally, since listing, there has been a nearly four-fold increase in the number of known populations. Of the 78 populations evaluated in the SSA, 24 (31%) have permanent protection and 18 (23%) have partial protection through voluntary agreements or other commitments of management (e.g., N.C. Department of Transportation). We conclude that the species is currently not in danger of extinction throughout its range.

In order to more closely examine the future threat posed by habitat loss or destruction, the Service analyzed three different development scenarios into the future to 2040. Under all scenarios evaluated, the number of currently known populations (78) remaining in highly, very highly, and moderately resilient condition is 56 (compared to 59 under current conditions). Only a small number (five or six) of currently low resilient populations are predicted to become extirpated under all scenarios evaluated. The species will continue to occur across its range, redundancy will remain high to moderately high, and representation will continue in its current condition providing current levels of adaptive capacity. Of the 78 populations evaluated in the SSA, 24 (31%) have permanent protection and 18 (23%) have partial protection through voluntary agreements or other commitments of management (e.g., N.C. Department of Transportation), reducing the likelihood of development impacting those populations. Recent examination of the species also identified climate change and invasive species as potential future threats. The broadened range (8 counties to 13) and significantly increased population numbers (24 to 78) since listing in 1989 indicate that the species benefits from sufficient redundancy and resiliency to withstand perturbations from climate change as well as from invasive species. Based on this analysis, we conclude that the species is neither currently in danger of extinction, nor likely to become so within the foreseeable future.

Status Throughout a Significant Portion of Its Range

Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so in the foreseeable future throughout all or a significant portion of its range. Having determined that the dwarf-flowered heartleaf is not in

danger of extinction or likely to become so in the foreseeable future throughout all of its range, we now consider whether it may be in danger of extinction or likely to become so in the foreseeable future in a significant portion of its range—that is, whether there is any portion of the species' range for which it is true that both (1) the portion is significant; and, (2) the species is in danger of extinction now or likely to become so in the foreseeable future in that portion. Depending on the case, it might be more efficient for us to address the "significance" question or the "status" question first. We can choose to address either question first. Regardless of which question we address first, if we reach a negative answer with respect to the first question that we address, we do not need to evaluate the other question for that portion of the species' range.

For dwarf-flowered heartleaf we chose to evaluate the status question (i.e., identifying portions where dwarf-flowered heartleaf may be in danger of extinction or likely to become so in the foreseeable future) first. We considered whether the threats are geographically concentrated in any portion of the species' range at a biologically meaningful scale. We examined the following threats: development, invasive and exotic species, and climate change, including cumulative effects.

The NCNHP monitored 13 populations of dwarf-flowered heartleaf throughout the species' range. Eleven of the 13 populations had invasive, exotic species identified as a threat, indicating that invasive, exotic species are found throughout the range and not concentrated in any specific location. Climate change effects, as discussed previously, are very uniform throughout the range (NCCV 2019). The opportunity for habitat loss and destruction due to development is higher on privately owned lands that could be sold for future development (Clarke 1995, entire). Of the 78 populations evaluated, we determined that 31 percent are permanently protected and another 23 percent are partially protected (i.e., voluntary landowner agreements). The unprotected populations are spread throughout the species' range and not geographically clustered together. While there is some variability in the habitats occupied by dwarf-flowered heartleaf across its range, the basic ecological components required for the

species to complete its life cycle are present throughout the habitats occupied by the 78 populations of the species. Accordingly, we found no concentration of threats in any portion of the dwarf-flowered heartleaf range at a biologically meaningful scale. Thus, there are no portions of the species' range where the species has a different status from its rangewide status. Therefore, no portions of the species' range provides a basis for determining that the species is in danger of extinction or likely to become an endangered species in the foreseeable future throughout a significant portion of its range. This approach is consistent with the courts' holdings in *Desert Survivors* v. *Department of the Interior*, No. 16-cv-01165-JCS, 2018 WL 4053447 (N.D. Cal. Aug. 24, 2018), and *Center for Biological Diversity v. Jewell*, 248 F. Supp. 3d, 946, 959 (D. Ariz. 2017).

Determination of Status

Our review of the best available scientific and commercial information indicates that the dwarf-flowered heartleaf does not meet the definition of an endangered species or a threatened species in accordance with sections 3(6) and 3(20) of the Act. Therefore, we propose to remove dwarf-flowered heartleaf from the Federal List of Endangered and Threatened Plants (50 CFR 17.12(h)).

Effects of this Proposed Rule

This proposal, if made final, would revise 50 CFR 17.12(h) to remove dwarf-flowered heartleaf from the Federal List of Endangered and Threatened Plants. The prohibitions and conservation measures provided by the Act, particularly through sections 7 and 9, would no longer apply to this species. Federal agencies would no longer be required to consult with the Service under section 7 of the Act in the event that activities they authorize, fund, or carry out may affect dwarf-flowered heartleaf.

Post-Delisting Monitoring

Section 4(g)(1) of the Act requires us to monitor for not less than 5 years the status of all species that are delisted. Post-delisting monitoring (PDM) refers to activities undertaken to

verify that a delisted species remains secure from the risk of extinction after the protections of the Act no longer apply. The primary goal of PDM is to monitor the species to ensure that its status does not deteriorate, and if a decline is detected, to take measures to halt the decline so that proposing it as an endangered or threatened species is not again needed. If at any time during the monitoring period, data indicate that protective status under the Act should be reinstated, we can initiate listing procedures, including, if appropriate, emergency listing. At the conclusion of the monitoring period, we will review all available information to determine if relisting, the continuation of monitoring, or the termination of monitoring is appropriate.

Section 4(g) of the Act explicitly requires that we cooperate with the States in development and implementation of PDM programs. However, we remain ultimately responsible for compliance with section 4(g) and, therefore, must remain actively engaged in all phases of PDM. We also seek active participation of other entities that are expected to assume responsibilities for the species' conservation after delisting.

Concurrent with this proposed delisting rule, we announce the draft PDM plan's availability for public review at *http://www.regulations.gov* under Docket Number FWS–R4–ES–2019–0081. Copies can also be obtained from the Service's Asheville Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**). We seek information, data, and comments from the public regarding dwarf-flowered heartleaf and the PDM plan. We are also seeking peer review of the draft PDM plan concurrently with this comment period. We anticipate finalizing the PDM plan, considering all public and peer review comments, prior to making a final determination on the proposed delisting rule.

Required Determinations

Clarity of the Proposed Rule

We are required by Executive Orders 12866 and 12988 and by the Presidential Memorandum of June 1, 1998, to write all rules in plain language. This means that each rule we publish must:

(1) Be logically organized;

(2) Use the active voice to address readers directly;

(3) Use clear language rather than jargon;

(4) Be divided into short sections and sentences; and

(5) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in **ADDRESSES**. To better help us revise the rule, your comments should be as specific as possible. For example, you should tell us the numbers of the sections or paragraphs that are not clearly written, which sections or sentences are too long, the sections where you feel lists or tables would be useful, etc.

National Environmental Policy Act

We have determined that we do not need to prepare an environmental assessment or environmental impact statement, as defined in the National Environmental Policy Act (42 U.S.C. 4321 *et seq*.), in connection with regulations adopted pursuant to section 4(a) of the Endangered Species Act. We published a notice outlining our reasons for this determination in the *Federal Register* on October 25, 1983 (48 FR 49244).

Government-to-Government Relationship with Tribes

In accordance with the President's memorandum of April 29, 1994, "Government-to-Government Relations with Native American Tribal Governments" (59 FR 22951), Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments), and the Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government-to-government basis. In accordance with Secretarial Order 3206 of June 5, 1997 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act), we readily acknowledge our responsibilities to work directly with tribes in developing programs for healthy ecosystems, to acknowledge that tribal lands are not subject to the same controls as Federal

public lands, to remain sensitive to Indian culture, and to make information available to tribes. There are no tribes or tribal lands affected by this proposed rule.

References Cited

A complete list of references cited is available on the Internet at *http://www.regulations.gov* under Docket No. FWS–R4–ES–2019–0081 and upon request from the Asheville Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**, above).

Authors

The primary authors of this proposed rule are staff members of the Service's Southeastern Region Recovery Team and the Asheville Ecological Services Field Office.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Proposed Regulation Promulgation

Accordingly, we propose to amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

1. The authority citation for part 17 continues to read as follows:

AUTHORITY: 16 U.S.C. 1361–1407; 1531–1544; and 4201–4245, unless otherwise noted.

§ 17.12 [Amended]

2. Amend § 17.12(h) by removing the entry for "*Hexastylis naniflora*" under "FLOWERING PLANTS" from the List of Endangered and Threatened Plants.

Martha Williams
Principal Deputy Director, Exercising the Delegated Authority of the Director, U.S. Fish and Wildlife Service

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